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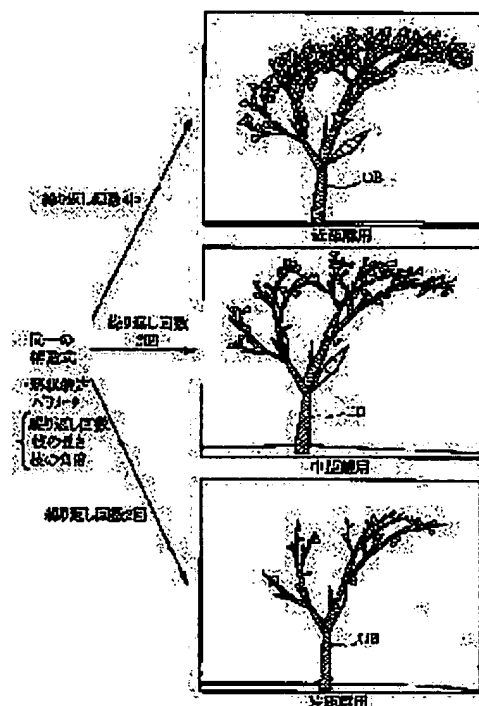
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(54) GAME SYSTEM AND INFORMATION MEMORY MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a game system with a memory medium of its information, which realizes processing of image generation, using a recursive generation of a self-similarity with small burden of processing and small memory capacity for use.

SOLUTION: A self-similarity is generated recursively by the predetermined number of times of repeating by using L system and the like, in which the number of repeat of generating the self-similarity is varied according to the distance from the viewpoint. The image of an object, which varies its precision according to the distance from the viewpoint, is generated, based on the same recursive structure expression and on the number of repeating of varying according to the distance from the viewpoint. The recursive structure expression and form specific parameters are made variable on real-time basis in the situation change of a game, and according to which in particular, rewriting of codes of the recursive structure expression, addition of a new code and deletion of a code are carried out. In the case the code to be processed is the one of a recursive call, the process returns to operating the code within the structure expression to call, after the recursive call is executed, the process is moved to operating the code within the structure expression to be called, and all code operations come to an end.



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CLAIMS**[Claim(s)]**

[Claim 1] the game system which performs image generation -- it is -- self -- a means by which only the given count of a repeat generates an analog recursively, and self -- the game system characterized by including a means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog, and a means to change said count of a repeat according to the distance from a view.

[Claim 2] the configuration specification parameter which contains the structure expression and said count of a repeat of a recursive mold in claim 1 -- being based -- self -- the game system characterized by to generate the image of an object from which precision changes according to the distance from a view based on said same recursive mold structure expression as said count of a repeat which changes according to the distance from a view when generating an analog recursively.

[Claim 3] the game system which performs image generation -- it is -- the structure expression and the configuration specification parameter of a recursive mold -- be base -- self -- a means generate an analog recursively , and self -- the game system characterize by to include a means generate the image in the given view in object space based on the information acquired by recursive generation of an analog , and a means change said recursive mold structure expression or said configuration specification parameter to real time according to change of a game situation .

[Claim 4] The game system characterized by deleting the code to which said recursive mold structure expression adds or contains a new code in said recursive mold structure expression or it rewrites the code which said recursive mold structure expression contains in claim 3 according to change of a game situation.

[Claim 5] claim 3 or 4 -- setting -- said configuration specification parameter -- self -- the count of a repeat of recursive generation of an analog, and self -- the game system characterized by changing said count of a repeat, the die length of said edge, or the branching include angle of said edge according to change of a game situation when the die length of the edge which constitutes an analog, or the branching include angle of an edge is included.

[Claim 6] claim 3 thru/or either of 5 -- setting -- self -- the game system characterized by substituting said basic parts according to change of a game situation when arranging the basic parts which constitute an object based on the information acquired by generating an analog recursively.

[Claim 7] the game system which performs image generation -- it is -- the structure expression and configuration specification parameter of a recursive mold -- being based -- self -- with a means to generate an analog recursively A means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog is included. self -- When it is the code for which the code of the recursive mold structure expression used as a processing object needs a recursive call The game system characterized by returning to processing of the code of the recursive mold structure expression of a calling agency after performing a recursive call, shifting to processing of the code of the recursive mold structure expression of a call place and completing processing of all the codes of the recursive mold structure expression of a call place.

[Claim 8] an information storage medium with an usable computer -- it is -- self -- a means to by_which only the given count of a repeat generates an analog recursively, and self -- the information storage medium characterized by to include the program for perform a means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog, and a means to change said count of a repeat according to the distance from a view.

[Claim 9] the configuration specification parameter which contains the structure expression and said count of a repeat of a recursive mold in claim 8 -- being based -- self -- the information storage medium characterized by to generate the image of an object from which precision changes according to the distance from a view based on said same recursive mold structure expression as said count of a repeat which changes according to the distance from a view when generating an analog recursively.

[Claim 10] an information storage medium with an usable computer -- it is -- the structure expression and configuration specification parameter of a recursive mold -- being based -- self -- with a means to generate an analog recursively self - with a means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog The information storage medium characterized by including the program for performing a means to change said recursive mold structure expression or said configuration specification parameter to real time according to change of a game situation.

[Claim 11] The information storage medium characterized by deleting the code to which said recursive mold structure expression adds or contains a new code in said recursive mold structure expression or it rewrites the code which said recursive mold structure expression contains in claim 10 according to change of a game situation.

[Claim 12] claim 10 or 11 -- setting -- said configuration specification parameter -- self -- the count of a repeat of recursive generation of an analog, and self -- the information storage medium characterized by changing said count of a repeat, the die length of said edge, or the branching include angle of said edge according to change of a game situation when the die length of the edge which constitutes an analog, or the branching include angle of an edge is included.

[Claim 13] claim 10 thru/or either of 12 -- setting -- self -- the information storage medium characterized by substituting said basic parts according to change of a game situation when arranging the basic parts which constitute an object based on the information acquired by generating an analog recursively.

[Claim 14] an information storage medium with an usable computer -- it is -- the structure expression and configuration specification parameter of a recursive mold -- being based -- self -- with a means to generate an analog recursively self - with a means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog When it is the code for which the code of the recursive mold structure expression used as a processing object needs a recursive call including the program for performing The information storage medium characterized by returning to processing of the code of the recursive mold structure expression of a calling agency after performing a recursive call, shifting to processing of the code of the recursive mold structure expression of a call place and completing processing of all the codes of the recursive mold structure expression of a call place.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a game system and an information storage medium.

[0002]

Background Art and Problem(s) to be Solved by the Invention] Before, the game system which generates the image which appears from the given view in the object space which is imagination three-dimension space is known, and it is popular as what can experience the so-called virtual reality. If the game system which can enjoy a racing game is taken for an example, a player will operate a racing car (model), and will be run a racing car in object space, and a three-dimension game will be enjoyed by competing with the racing car which other players and computers operate.

[0003] In such a game system, it has been an important technical technical problem to generate a realistic image more for improvement in the virtual reality of a player. Therefore, to be able to express by the realistic image more is desired also about vegetation, such as a tree arranged at a map.

[0004] And the technique called L system which botanist A.Lindenmayer devised is conventionally known by adopting how attaching the branch of such vegetation, and a leaf the technique which can be simulated with reality. the structure expression and configuration specification parameters (the die length of a branch, branching include angle of a branch, etc.) which described the vegetable production rule by this L system -- being based -- self -- how to attach a vegetable branch and a leaf is simulated with reality by generating an analog recursively.

[0005] However, this L system was not yet used in the game system by which a real-time operation is demanded, although used in the field of CG (Computer Graphics) as which a real-time operation is not required. And in order to realize the technique of L system in a game system, it becomes an important technical technical problem how image generation of the vegetation using L system is realizable with little processing burden and small operating storage capacity.

[0006] By the way, the technique called LOD (LevelOf Detail) which changes a model according to the distance from a view (virtual camera) is conventionally known by making the burden of the image generation processing in a game system into the relief-ized technique. When the distance of a view and an object is near, a model with many polygons expresses an object, and as shown in drawing 1 (A), when the distance of a view and an object is far, a model with few polygons expresses an object in this conventional LOD. While this maintains the quality of the image obtained, the number of the polygons which should draw in one frame can be reduced.

[0007] However, in this conventional LOD, two or more models must be prepared as a model showing an object like for example, the object for short distances, the object for middle distance, and the model for long distances. Therefore, as shown in drawing 1 (B), there is a trouble that operating storage capacity required for a model data storage will buildup-ize.

[0008] Moreover, in the conventional LOD, there is also a trouble that the shock of the screen in the case of a model change is great. For example, if a player notices that the model changed in case it changes from the model for middle distance to the model for short distances, the virtual reality of a player will be spoiled substantially. And they are the object for the 1st distance, an object for the 2nd distance, and an object for the 3rd distance as the technique of solving this problem..... The technique of increasing the number of the models to prepare is also considered like the Mth model for distance. However, according to this technique, the above-mentioned trouble that the operating storage capacity of model data buildup-izes will become still more serious.

[0009] the place which this invention is made in view of the above technical problems, and is made into the object -- self -- it is in offering the game system and information storage medium which can realize image generation processing in which recursive generation of an analog was used, with little processing burden and small operating storage capacity.

[0010]

[Means for Solving the Problem] the game system by which this invention perform image generation in order to solve the above-mentioned technical problem -- it be -- self -- a means to by_which only the given count of a repeat generate an analog recursively , and self -- it be characterize by to include a means generate the image in the given view in object space based on the information acquired by recursive generation of an analog , and a means change said count of a repeat according to the distance from a view . Moreover, the information storage medium concerning this invention is characterized by including the program for being an usable information storage medium and performing the above-mentioned means by computer. Moreover, the program concerning this invention is characterized by including the manipulation routine for being an usable program (the program embodied by the subcarrier being included), and performing the above-mentioned means by computer.

[0011] according to this invention -- self -- an analog is recursively generated only for the given count of a repeat. And based on the information acquired by this generation, the image in the given view in object space is generated. for example, self -- by arranging basic parts based on the information acquired by recursive generation of an analog, an image is generated, or a texture is generated based on the above-mentioned information, and an image is generated using the generated texture.

[0012] And in this invention, the above-mentioned count of a repeat changes according to the distance from a view. Thereby, change of the precision of the image of an object etc. can be realized now at little processing burden that it is only to change the count of a repeat.

[0013] In addition, depth distance is sufficient as the distance from a view, the slant range of a view and an object is sufficient as it, and such distance and an equal parameter are sufficient as it.

[0014] moreover, the configuration specification parameter with which the game system, the information-storage medium, and the program concerning this invention contain the structure expression and said count of a repeat of a recursive mold -- be base -- self -- it be characterize by to generate the image of an object from which precision change according to the distance from a view based on said same recursive mold structure expression as said count of a repeat which change according to the distance from a view when generate an analog recursively.

[0015] If it does in this way, it will become possible using the same recursive mold structure expression to change the precision of the image of an object. Therefore, a realistic image can be generated more now with small operating storage capacity.

[0016] moreover , the game system by which this invention perform image generation -- it be -- the structure expression and the configuration specification parameter of a recursive mold -- be base -- self -- a means generate an analog recursively , and self -- it be characterize by to include a means generate the image in the given view in object space based on the information acquired by recursive generation of an analog , and a means change said recursive mold structure expression or said configuration specification parameter to real time according to change of a game situation . Moreover, the information storage medium concerning this invention is characterized by including the program for being an usable information storage medium and performing the above-mentioned means by computer. Moreover, the program concerning this invention is characterized by including the manipulation routine for being an usable program (the program embodied by the subcarrier being included), and performing the above-mentioned means by computer.

[0017] according to this invention -- a recursive mold structure expression and a configuration specification parameter -- being based -- self -- an analog is generated recursively. And based on the information acquired by this generation, the image in the given view in object space is generated.

[0018] And in this invention, the above-mentioned recursive mold structure expression or the above-mentioned configuration specification parameter changes to real time according to change of a game situation. Therefore, the suitable image according to a game situation can be generated now by simple processing in which it is only to change a recursive mold structure expression and a configuration specification parameter, and a realistic image can be generated at little processing burden.

[0019] In addition, they are the case where various events occur that a game situation changes for example, in the game world, the case where the parameter used for the various decision in game processing changes, etc.

[0020] Moreover, or the game system, information storage medium, and program concerning this invention rewrite the code which said recursive mold structure expression contains according to change of a game situation, they are characterized by deleting the code to which said recursive mold structure expression adds or contains a new code in said recursive mold structure expression.

[0021] If it does in this way, a code is rewritten, signs that a season changes by simple processing of addition, deletion, etc., signs that a tree grows, etc. can be expressed now, and a realistic image can be generated more at little processing burden.

[0022] moreover, the game system, information storage medium, and program concerning this invention -- said configuration specification parameter -- self -- the count of a repeat of recursive generation of an analog, and self -- when the die length of the edge which constitute an analog, or the branching include angle of an edge be include, it be characterize by change said count of a repeat, the die length of said edge, or the branching include angle of said edge according to change of a game situation.

[0023] If it does in this way, signs that a season changes, signs that a tree grows, etc. can be expressed now by simple processing in which the count of a repeat, the die length of an edge, and the branching include angle of an edge are changed, and a realistic image can be generated more at little processing burden.

[0024] moreover, the game system, information storage medium, and program concerning this invention -- self -- when arranging the basic parts which constitute an object based on the information acquired by generating an analog recursively, it is characterized by substituting said basic parts according to change of a game situation.

[0025] If it does in this way, though the same recursive mold structure expression will be used, it becomes possible to change the image of an object variously, and it can improve the virtual reality of a player.

[0026] moreover, the game system by which this invention performs image generation -- it is -- the structure expression and configuration specification parameter of a recursive mold -- being based -- self -- with a means to generate an analog recursively A means to generate the image in the given view in object space based on the information acquired by recursive generation of an analog is included. self -- When it is the code for which the code of the recursive mold structure expression used as a processing object needs a recursive call After performing a recursive call, shifting to processing of the code of the recursive mold structure expression of a call place and completing processing of all the codes of the recursive mold structure expression of a call place, it is characterized by returning to processing of the code of the recursive mold structure expression of a calling agency. Moreover, the information storage medium concerning this invention is characterized by including the program for being an usable information storage medium and performing the above-mentioned means by computer. Moreover, the program concerning this invention is characterized by including the manipulation routine for being an usable program (the program embodied by the subcarrier being included), and performing the above-mentioned means by computer.

[0027] according to this invention -- a recursive mold structure expression and a configuration specification parameter -- being based -- self -- an analog is generated recursively. And based on the information acquired by this generation, the image in the given view in object space is generated.

[0028] And in this invention, when it is the code (for example, code of the code of the node in node lilac ITINGU, and the edge in edge lilac ITINGU) for which the code of a processing object needs a recursive call, a recursive call is performed and it shifts to processing of the code of the structure expression of a call place. And on condition that processing of all the codes in a call place was completed, it returns to processing of the code of the structure expression of a calling agency. If it does in this way, the amount of the data (for example, a location, a rotation matrix, etc.) which must be temporarily held to a stack etc. can be reduced now, and economization of the operating storage capacity of memory can be aimed at.

[0029]

[Embodiment of the Invention] Hereafter, the suitable operation gestalt of this invention is explained using a drawing.

[0030] 1. An example of the functional block diagram of the game system (image generative system) of this operation gestalt is shown in a block diagram 2 . in addition, in this drawing, this operation gestalt can be used as the component of arbitration about the other block that what is necessary is just to include the processing section 100 at least (or the processing section 100 and the storage section 170 -- containing -- ****ing).

[0031] A control unit 160 is for a player to input actuation data, and can realize the function by hardware, such as a lever, a carbon button, a microphone, or a housing.

[0032] The storage section 170 serves as work-piece fields, such as the processing section 100 and the communications department 196, and can realize the function by hardware, such as RAM.

[0033] The information storage medium (it is an usable storage by the computer) 180 stores the information on a program, data, etc., and can realize the function by hardware, such as an optical disk (CD, DVD), a magneto-optic disk (MO), a magnetic disk, a hard disk, a magnetic tape, or memory (ROM). The processing section 100 performs various processings of this invention (this operation gestalt) based on the information stored in this information storage medium 180. That is, the information (a program or data) for performing the means (block included especially in the processing section 100) of this invention (this operation gestalt) is stored in the information storage medium 180.

[0034] In addition, informational a part or informational all that is stored in the information storage medium 180 will be transmitted to the power up to a system etc. at the storage section 170. Moreover, the information for processing according to the information for directing the program for processing this invention, image data, sound data, the

configuration data of a display object, and processing of this invention or its directions etc. can be included in the information storage 180.

[0035] A display 190 outputs the image generated by this operation gestalt, and can realize the function by hardware, such as CRT, LCD, or HMD (head mount display).

[0036] The sound output section 192 outputs the sound generated by this operation gestalt, and can realize the function by hardware, such as a loudspeaker.

[0037] The personal data of a player, the save data of a game, etc. are memorized, and the pocket mold information storage device 194 can consider a memory card, pocket mold game equipment, etc. as this pocket mold information storage device 194.

[0038] The communications department 196 performs various kinds of control for communicating between the exteriors (for example, host equipment and other game systems), and can realize the function by hardware, such as various processors or ASIC for a communication link, a program, etc.

[0039] In addition, you may make it distribute the program or data for performing the means of this invention (this operation gestalt) to the information storage medium 180 through a network and the communications department 196 from the information storage medium which host equipment (server) has. The activity of the information storage medium of such host equipment (server) is also included within the limits of this invention.

[0040] The processing section 100 (processor) performs various kinds of processings, such as game processing, image generation processing, or sound generation processing, based on actuation data, a program, etc. from a control unit 160. The function of this processing section 100 is realizable with hardware, such as various processors (CPU, DSP, etc.) or ASIC (gate array etc.), and a given program (game program).

[0041] In addition, the function of the processing section 100 may realize the all by hardware, and may realize the all by the program. Or both hardware and a program may realize.

[0042] The processing section 100 contains the game processing section 110, the image generation section 120, and the sound generation section 130.

[0043] The game processing section 110 here Receptionist processing of coin (price), setting-out processing in various modes, the location of progress processing of a game, selection instrument setup processing, and an object (1 or two or more primitive sides), and angle of rotation (X --) The processing which asks for Y or circumference angle of rotation of the Z-axis, the processing (motion processing) which operates an object, The processing which asks for the location (location of a virtual camera) and look include angle (angle of rotation of a virtual camera) of a view, The processing which arranges objects, such as a map object, to object space, Various game processings of the processing for playing in hit-checking processing, the processing which calculates a game result (a result, results), and the game space where two or more players are common, or game exaggerated processing are performed based on actuation data, a program, etc. from a control unit 160.

[0044] The image generation section 120 generates the image which appears from a given view (virtual camera) in object space based on the game processing result from the game processing section 110, and outputs it to a display 190.

[0045] The sound generation section 130 performs various kinds of sound processings based on the game processing result from the game processing section 110, generates sounds, such as BGM, a sound effect, or voice, and outputs them to the sound output section 192.

[0046] the game processing section 110 -- self -- an analog -- the generation section 112, the distance operation part 114, a structure expression and the parameter change section 116, and the parts substitution section 118 are included.

[0047] here -- self -- an analog -- the generation section 112 -- self -- processing which repeats an analog recursively and generates it is performed. the configuration specification parameter which contains the structure expression of a recursive mold, the die length of the count of a repeat, and an edge (branch), or the branching include angle of an edge if the case where the technique of L system is used is taken for an example -- being based -- self -- processing which generates an analog recursively is performed.

[0048] in addition, self -- when generating an image based on the information acquired by generating an analog recursively, by arranging the basic parts which constitute an object based on the acquired information, an image may be generated, a texture may be generated based on the acquired information and an image may be generated using the generated texture.

[0049] The distance operation part 114 performs processing which calculates the distance (distance of a view and an object) from a view. Here, as a distance from a view, the depth distance of an object, the slant ranges of a view and an object or such distance, and equal various parameters (for example, magnitude on the screen of the object after transparent transformation etc.) can be considered.

[0050] A structure expression and the parameter change section 116 perform processing to which a recursive mold

structure expression and a configuration specification parameter (geometric parameter) are changed according to the distance from the view acquired by the distance operation part 114, and change of a game situation. the self which a configuration specification parameter more specifically contains -- according to change of a game situation, rewrite the code of a recursive mold structure expression, a new code is added to a recursive mold structure expression, or the code of a recursive mold structure expression is deleted [**** / changing the count of a repeat of an analog according to the distance from a view]. or change of a game situation -- responding -- self -- the count of a repeat of an analog, and self - the die length of an edge and the branching include angle of an edge which constitute an analog are changed.

[0051] In addition, change of a game situation is the case where various events (burning an event, a seasonal-variation event, the GAME STAGE change event, etc.) occur for example, in the game world, the case where the parameters (a time parameter, status parameter of a character, etc.) used for the various decision (decision of game progress, decision of a game result, etc.) in game processing change, etc.

[0052] Moreover, information, such as a recursive mold structure expression and a configuration specification parameter, will be memorized by the primary storage 172 which the storage section 170 contains.

[0053] The parts substitution section 118 performs processing which substitutes the basic parts which constitute an object according to change of a game situation. namely, self -- though it uses the same structure expression and a configuration specification parameter by substituting basic parts in arranging the basic parts of an object based on the information acquired by generation of an analog, the image which receives a different impression can be generated.

[0054] In addition, the game system of this operation gestalt may be used as the system only for single handicap player modes which can play only one person's player, and may be used as a system equipped not only with such single handicap player mode but the multi-player mode which can play two or more players.

[0055] Moreover, when two or more players play, the game image and game sound with which two or more of these players are provided may be generated using one terminal, and may be generated using two or more terminals (a game machine, cellular phone) connected in the network (a transmission line, communication line) etc.

[0056] 2. Description 2.1 of this operation gestalt The technique of L system used with L system ***** operation gestalt is explained.

[0057] L system is positioned as a fractal kind and is the optimal fractal technique for a vegetable mathematical expression. In L system, the configuration specification parameter containing the structure expression (code train) of a recursive mold, the count of a repeat and the die length of an edge (branch), the branching include angle of an edge, etc. is used. Only the count specified by the count of a repeat in which a configuration specification parameter contains the structure expression of a recursive mold is developed. And as the expansion technique of a structure expression, there are node lilac ITINGU and edge lilac ITINGU.

[0058] for example, self when the following structure expression (1) is developed by node lilac ITINGU, as shown in drawing 3 -- an analog -- the graphic form of structure is generated.

[0059]

A->B[+A] B[-A] BA (1)

In addition, the response relation table of the activity of each code and each code which a structure expression contains is shown in drawing 4 . It directs that "00" is the termination of a code. "01 (A)", "02 (B)", "03 (L)", and "04 (F)" direct generation of a node, a branch, a leaf, and a flower respectively. "06 (I)" and "07(J)" direct initiation of branching, and termination. "08 (+)" and "09 (-)" direct right deflection and left deflection. "0A (&)" and "0B (^)" direct a right pitch and a left pitch. "0C (\)" and "0D (/)" direct a right roll and a left roll. "0E (l)" directs a revolution 180 degrees.

[0060] The above-mentioned structure expression (1) is developed as follows.

** First, since the code of the beginning of a structure expression (1) is "B", as shown in drawing 5 (A), generate a branch B1. In addition, the die length of each branch (a wide sense edge) generated is specified with a configuration specification parameter.

** Since the next code of a structure expression (1) is "[+A]", as shown in drawing 5 (B), set up the node N1 of right branching. In addition, the branching include angle in each node is specified with a configuration specification parameter.

** Since the next code of a structure expression (1) is "B", as shown in drawing 5 (C), it generates branch B-2.

** Since the following code is "[-A]", as shown in drawing 5 (D), set up the node N2 of left branching.

** Since the following code is "BA", as shown in drawing 5 (E), while generating a branch B3, set up a node N3.

** the self which made the die length of a branch (edge) one half according to the regulation of "A->" since processing of all codes was completed -- generate an analog recursively in the location of each nodes N1, N2, and N3. That is, "B [+A] B[-A] BA" is substituted for the part of "A" of "B[+A] B[-A] BA" of a structure expression (1), and a structure expression (1) is developed recursively.

[0061] for example, the self of right branching which made the die length of a branch one half in the location of a node N1 as shown in drawing 5 (F) - (J) -- an analog (B11, B12, B13) is generated. the same -- the self of left branching in a node N2 -- an analog generates -- having -- a node N3 -- the self of the rectilinear-propagation direction -- an analog is generated.

[0062] The graphic form of the complicated self-parallelism structure where recursive expansion of the above-mentioned structure expression (1) is shown in drawing 3 by repeating by the count of a repeat which a configuration specification parameter contains is generable.

[0063] On the other hand, if the following structure expression (2) is developed by edge lilac ITINGU, the graphic form of self-parallelism structure as shown in drawing 6 will be generated.

[0064]

B->B[+B] B [-B] B (2)

A structure expression (2) is developed as follows.

** First, since the code of the beginning of a structure expression (2) is "B", as shown in drawing 7 (A), generate a branch B1.

** Since the next code of a structure expression (2) is "[+B]", as shown in drawing 7 (B), it generates branch B-2 of right branching.

** Since the next code of a structure expression (2) is "B", as shown in drawing 7 (C), it generates a branch B3.

** Since the following code is "[-B]", as shown in drawing 7 (D), it generates branch B4 of left branching.

** Since the following code is "B", as shown in drawing 7 (E), it generates branch B5.

** the self which made the die length of a branch (edge) one half according to the regulation of "B->" since processing of all codes was completed -- generate an analog recursively in the location of each branch B1, B-2, B3, B4, and B5. That is, "B[+B] B[-B] B" is substituted for the part of "B" of "B[+B] B[-B] B" of a structure expression (2), and a structure expression (2) is developed recursively.

[0065] for example, the self which made the die length of a branch one half in the location of a branch B1 as shown in drawing 7 (F) - (J) -- an analog (B11, B12, B13, B14, B15) is generated, and it draws a top and is carried out. the same - branch B-2 -- right branching and a branch B3 -- the rectilinear-propagation direction and branch B4 -- left branching and branch B5 -- the self of the rectilinear-propagation direction -- an analog is generated, and it draws a top and is carried out.

[0066] The graphic form of the complicated self-parallelism structure where recursive expansion of a structure expression (2) is shown in drawing 6 by repeating by the count of a repeat which a configuration specification parameter contains is generable.

[0067] self like [in drawing 8] drawing 3 and drawing 6 -- based on the information acquired by recursive generation of an analog, basic parts (it consists of primitive sides, such as a polygon), such as a branch which constitutes Object alumnus (tree), a leaf, and a flower, are arranged, and the image of Object alumnus is generated. That is, branch parts are arranged along the direction, on the edge generated in code of "L (03)", leaf parts are arranged along the direction by the edge generated in code of "B (02)", and flower parts are arranged along the direction at the edge generated in code of "F (04)."

[0068] If it does in this way, the image of the object (tree) of various configurations can be generated by changing only a structure expression, using basic parts in common. In this case, since much amount of data of a structure expression is about hundreds of bytes even if there is, it does not press the operating storage capacity of memory, either.

[0069] Moreover, if the basic parts itself are substituted, the variation of the image of an object can be increased easily.

[0070] For example, the image of the object of a different impression can be generated only by changing the configuration and texture of basic parts. If various basic parts are prepared, it will also become possible to use these basic parts properly according to a game situation. And since basic parts are units, such as a branch and a leaf, even if it registers some kinds, operating storage capacity of memory is not pressed so much.

[0071] In addition, drawing 3 and the graphic form itself drawn like drawing 6 may be adopted as an image of a tree, or drawing 3 and the graphic form drawn like drawing 6 may be set up as a texture, and a desired image may be generated by mapping this texture in a given object.

[0072] 2.2 one description of the implementation of LOD by adjustable control of the count of a repeat, now this operation gestalt -- the distance from a view -- responding -- self -- be in the point of changing the count of a repeat of generation of an analog.

[0073] that is, it is shown in drawing 9 (A) -- as -- case the distance (distance of a view and Object alumnus) from a view is near -- self -- the count of a repeat of generation of an analog (count of recurrence) is enlarged, and the precision of Object alumnus is raised.

[0074] On the other hand, as shown in drawing 9 (B), the distance from a view makes at least inside at least inside and makes [inside] precision of Object alumnus at least inside also for the count of a repeat at a case.

[0075] Moreover, as shown in drawing 9 (C), when the distance from a view is far, the count of a repeat is also lessened and makes precision of Object alumnus low.

[0076] for example, L system -- like -- the structure expression of a recursive mold -- repeating -- a count (configuration specification parameter) -- being based -- self -- in generating an analog recursively, as shown in drawing 10 , based on the same recursive mold structure expression as the count of a repeat which changes according to the distance from a view, it generates the image of Object alumnus from which precision changes according to the distance from a view.

[0077] If it does in this way, the image of Object alumnus can be generated with the suitable precision according to each distance, and a realistic image can be generated more at little processing burden.

[0078] In addition, in drawing 9 (A), (B), (C), and drawing 10 , although the phase of distance was divided into the three-stage like a short distance, middle distance, and a long distance, you may divide into two steps and may divide into four or more steps.

[0079] For example, as shown in drawing 1 (A), as a model showing an object, like the object for short distances, the object for middle distance, and the model for long distances, two or more models were prepared and the model to be used was changed in the conventional LOD according to the distance from a view.

[0080] However, in this conventional example, as shown in drawing 1 (B), model data are needed only for a number of a model of parts to prepare. Therefore, there is a trouble that the operating storage capacity of model data will buildup-ize.

[0081] Moreover, there is also a trouble that the shock of the screen in the case of a model change will be great, and a player will notice that the model changed. And that this trouble should be solved, if the number of models is increased further, the problem of buildup-izing of the amount of data of model data will become still more serious.

[0082] On the other hand, with this operation gestalt, as shown in drawing 10 , the image of Object alumnus with which precision differs is generable using the same structure expression. That is, though the same basic parts as the same structure expression are used, according to the distance from a view, the precision of Object alumnus can be changed only by changing only the count of a repeat according to distance. Therefore, LOD can be realized without preparing many models and the operating storage capacity of memory can be saved.

[0083] Moreover, according to this operation gestalt, it also becomes possible to change the precision of an object seamlessly by changing and carrying out and changing a count seamlessly, and it also becomes possible to prevent the shock produced on a screen. Moreover, also when changing the count of a repeat seamlessly in this way, since it is eternal, the amount of data of a structure expression or basic parts does not produce the problem that the amount of data of model data as shown in drawing 1 (B) will increase extremely, either.

[0084] 2.3 With change of the structure expression according to a game situation, a configuration specification parameter, and basic parts, now this operation gestalt, the structure expression and configuration specification parameter of a recursive mold are changed to real time according to change of a game situation.

[0085] For example, when the structure expression used as the original form is a bottom type (3), the image of Object alumnus as shown in drawing 11 (A) is generated.

[0086]

A->[+\A -- /L][-/A++F]+A (3)

With this operation gestalt, the code of a structure expression is rewritten according to change of a game situation.

[0087] for example, code "F of the flower in the above-mentioned structure expression (3) -- " -- the code of a leaf -- if it rewrites to "L", a structure expression will become like a bottom type (4).

[0088]

A->[+\A -- /L][-/A++L]+A (4)

If this structure expression (4) is used, the image of the object alumnus of drawing 11 (A) will change to an image as shown in drawing 11 (B).

[0089] Moreover, with this operation gestalt, a code is added to a structure expression according to change of a game situation.

[0090] for example, the above-mentioned structure expression (4) -- a code -- if "[+\L] and [//+L]" are added, a structure expression will become like a bottom type (5).

[0091]

A->[+\A -- /L], [[+\L] [//+L]-/A++L]

+A (5)

If this structure expression (5) is used, the image of the object alumnus of drawing 11 (B) will change to an image as

shown in drawing 11 (C).

[0092] In addition, you may make it delete the code of a structure expression according to change of a game situation.

[0093] For example, if rewriting of such a code, addition, or deletion is performed when the season in the game world changes (when a game situation changes to a wide sense), the image of Object alumnus can be used as the suitable image according to each season, and the reality of an image can be increased. And since required processing requires rewriting and addition of the code of a structure expression, and only deletion, its processing load is also light.

[0094] Moreover, if it is going to realize image change as shown in drawing 11 (A), (B), and (C) by the technique of model substitution, two or more kinds of different polygon models will be needed, and the operating storage capacity of memory will be pressed.

[0095] On the other hand, the structure expression which serves as the original form for generating the image of drawing 11 (A), (B), and (C) with this operation gestalt ends one, and there is also little amount of data of a structure expression as about hundreds of bytes. Therefore, compared with the technique of model substitution, the operating storage capacity of memory can be saved substantially.

[0096] In drawing 12, the count of a repeat which a configuration specification parameter contains is changed according to change of a game situation. Thus, by changing the count of a repeat, the shape complexity of Object alumnus can be gradually adjusted now according to a game situation.

[0097] For example, if the count of a repeat is increased as a time parameter changes and the time amount in the game world passes, signs that a tree grows gradually and it goes etc. can be expressed.

[0098] Moreover, since the load of processing to other objects became heavy, when change of the game situation of allowances stopping there not being in processing of the processing section 100 (CPU) of drawing 2 etc. arises, it becomes possible by lessening the count of a repeat to give allowances to processing of the processing section 100.

[0099] In addition, you may make it change the die length of an edge and the branching include angle of an edge which a configuration specification parameter contains according to change of a game situation. For example, signs that a tree grows gradually and it goes by changing the die length of an edge (branch) according to change of a time parameter etc. can be expressed.

[0100] Moreover, he is trying to substitute the basic parts which constitute an object with this operation gestalt according to change of a game situation.

[0101] For example, in drawing 13 (A) and (B), the branch parts which constitute Object alumnus are substituted according to change of a game situation. That is, at drawing 13 (A), the branch parts with which the white texture was mapped are used, and the branch parts with which the brown texture was mapped are used by drawing 13 (B).

[0102] For example, when the season in the game world is winter, the branch parts with which the texture of white as shown in drawing 13 (A) was mapped are used, and when the season in the game world is summer, the branch parts with which the texture of brown as shown in drawing 13 (B) was mapped are used. If it does in this way, the image of Object alumnus comes to change according to a seasonal change, and the virtual reality of a player can be increased.

[0103] 3. Explain the example of a detail of processing of this operation gestalt, next processing of this operation gestalt using the flow chart of drawing 14 - drawing 19.

[0104] Drawing 14 is the flow chart of processing of a main routine.

[0105] First, processing is initialized (step S1). More specifically, the structure expression used as the original form, a configuration specification parameter, processing that prepares basic parts are performed.

[0106] Next, it judges about whether the tree burned and the event occurred (did the game event occur in the wide sense or not?) (step S2). For example, in a flight simulation game, if an airplane crashes into the woods on a map or a missile hits them, a tree will burn and an event will occur. And if it is judged that it burned and the event occurred, it will burn and will shift to event processing (step S3).

[0107] Next, seasonal variation is processed (step S4). And processing (step S5) of distance change and processing (step S6) of time amount progress are performed, and it returns to step S2. These processings are performed for every frame.

[0108] Drawing 15 burns and is the flow chart of event processing.

[0109] If it is judged that fire burned with the tree by crash of an airplane, hit of a missile, etc., and it moved (step S11), the code of the leaf which the structure expression showing a tree contains, and the code of a flower will be deleted (step S12). And branch parts are substituted for the parts showing a withered branch (step S13).

[0110] If it does in this way, a tree will come to be constituted by only branch parts and will be substituted for the parts with which the branch parts moreover also express a withered branch. Therefore, it can show as if the tree had burned out by fire, and the virtual reality of a player can be increased.

[0111] Drawing 16 is the flow chart of processing of seasonal variation.

[0112] First, it is confirmed which season the current season in the game world is (step S21). And when a current season

is spring, an end-crater Mino code is added to the structure expression showing a tree (steps S22 and S23). Moreover, when a current season is summer, an end-crater Mino code is rewritten in the code of a flower (steps S24 and S25). Moreover, when a current season is autumn, the code of a flower is rewritten in the code of a fruit (steps S26 and S27). Moreover, when a current season is winter, the code of a fruit is deleted from a structure expression (steps S28 and S29).

[0113] By doing in this way, if spring comes, a bud will be attached to a tree, and if the flower will become very much if the bud will become a flower if summer comes, and autumn comes, and winter comes, expression that the fruit will not have fallen will be attained. By this, it becomes possible to impress a seasonal change in a player, and the virtual reality of a player can be increased.

[0114] Drawing 17 is the flow chart of processing (LOD) of distance change.

[0115] First, the distance L from a view to an object is found (step S31). In this case, you may make it set up the magnitude on the screen of the object after transparent transformation as a parameter of distance L.

[0116] Next, it judges whether distance L is smaller than near (short distance) (step S32). And in being small, it sets repeat (initial value of the count of a repeat) to the count R of a repeat (step S33).

[0117] Next, it judges whether distance L is smaller than middle (middle distance) (step S34). And in being small, it sets repeat-1 to the count R of a repeat (step S35). On the other hand, distance L sets repeat-2 to the count R of a repeat, in being larger than middle (step S35).

[0118] If it does in this way, Count R can become small repeatedly, so that the distance L from a view to an object is large (R becoming large, so that L is small), and the precision (shape complexity) of an object can be changed according to the distance from a view.

[0119] Drawing 18 is the flow chart of time amount progress processing.

[0120] First, it judges whether grow is [whenever / growth] smaller than the growth limitation max (step S41). And in being small, only 1 increments grow whenever [growth] (step S42). And die-length length of a branch (edge) is calculated according to the formula of $\text{length} = \text{grow} \times \text{weight}$ (weighting multiplier) (step S43).

[0121] If it does in this way, signs that die-length length of a branch is extended with time amount progress, and come to go, and a tree grows and it goes can be expressed with reality.

[0122] Drawing 19 is the flow chart of expansion processing of a structure expression.

[0123] First, n which is the argument of code [n] of a structure expression is reset to 0 (step S51).

[0124] Next, it judges whether it is termination of code (step S52), and in being termination of code, it ends expansion processing of a structure expression. For example, when the maximum number of code which a structure expression contains is 100 pieces, if the 100th code is processed, it will be judged that it is termination of code.

[0125] Next, code [n] judges whether it is "00 (code termination)" (step S53). And in the case of "00", processing is returned from a recursive call place at a calling agency (step S54).

[0126] Next, code [n] judges whether it is "01 (node)" (step S55). And when code [n] is "01", it judges whether count (the recursive depth, count of a repeat) is larger than 0 (step S56). And in being larger than 0, only 1 carries out the decrement of the count (step S57), and it performs a recursive call (step S58). That is, its own manipulation routine (expansion processing of a structure expression) is called, and it returns to step S51. And if it returns from a call place recursive at step S54, only 1 will increment count (step S59).

[0127] On the other hand, when count is judged to be zero or less at step S56, only 1 increments n (step S69).

[0128] When judged as "N" at step S55, code [n] is "02 (branch), and 03 (leaf) and 04 (flower). It judges whether it is 05" (step S60). And the corresponding parts are drawn when code(s) [n] are "02-05" (step S61). And the location XYZ used as the next starting point is computed (step S62), and only 1 increments n (step S69).

[0129] When judged as "N" at step S60, code [n] judges whether it is "06 (branching initiation)" (step S63). When code [n] is "06", a stack is loaded with the location XYZ at that time, and rotation-matrix M (step S64), and only 1 increments n (step S69).

[0130] When judged as "N" at step S63, code [n] judges whether it is "07 (branching termination)" (step S65). When code [n] is "07", only 1 increments ejection (step S66) and n from a stack for a location XYZ and rotation-matrix M (step S69).

[0131] When judged as "N" at step S65, code [n] judges whether they are "08 (right deflection)-0E (180-degree revolution)" (step S67). When code(s) [n] are "08-0E", processing which asks for rotation-matrix M is performed, and only 1 increments (step S68) and n (step S69).

[0132] Processing of drawing 19 at the time of developing the following structure expression (6) by node lilac ITINGU is explained using drawing 20 (A) - (H) and drawing 21 (A) - (D). In addition, the initial value of count (recursive depth) presupposes that it is 1.

[0133]

A->B[+A] B[-A] BA (6)

First, it is judged as code[0] =02(B) at step S60 of drawing 19 , and shifts to steps S61 and S62, and as shown in drawing 20 (A), a branch B1 is generated. And it shifts to step S69 and an increment is carried out to n= 1.

[0134] Next, it is judged as code[1] =06(I) at step S63, and shifts to step S64, and a stack is loaded with the location XYZ at that time, and rotation-matrix M. And it shifts to step S69 and an increment is carried out to n= 2.

[0135] Next, it is judged as code[2] =08(+) at step S67, and processing of rotation-matrix M of right branching is performed. And it shifts to step S69 and an increment is carried out to n= 3.

[0136] Next, it is judged as code[3] =01(A) at step S55, and shifts to step S56. And it is judged as count=1>0 at step S56, and a decrement is carried out to count=0 at step S57. And as step S58 shows to drawing 20 (B), a recursive call is performed, and it shifts to processing of the code of the structure expression (structure expression of a recursive lower layer) of a call place. That is, it is reset by step S51 return and n= 0.

[0137] Next, as shown in drawing 20 (C) and (D), while the sequential increment of the n is carried out, sequential generation of the branches B11, B12, and B13 is carried out by the code of the structure expression of a call place. And it is judged as code[12] =00 (code termination) at step S53, and it is made processing of the code of the structure expression (structure expression of the recursive upper layer) of a calling agency at step S54, and an increment is carried out to count=1 at return and step S59.

[0138] Next, as shown in drawing 20 (E) and (F), after branch B-2 is generated by the code of the structure expression of a calling agency, a recursive call is performed at step S58. And as shown in drawing 20 (G) and (H), sequential generation of the branches B21, B22, and B23 is carried out by the code of the structure expression of a call place. And if judged as code[12] =00 (code termination) at step S53, it will return to processing of the code of the structure expression of a calling agency at step S54.

[0139] Next, as shown in drawing 21 (A) and (B), after a branch B3 is generated by the code of the structure expression of a calling agency, a recursive call is performed at step S58. And as shown in drawing 21 (C) and (D), sequential generation of the branches B31, B32, and B33 is carried out by the code of the structure expression of a call place. And if judged as code[12] =00 (code termination) at step S53, it will return to processing of the code of the structure expression of a calling agency at step S54.

[0140] Thus, with this operation gestalt, when it is the code (A) for which the code of the structure expression used as a processing object needs a recursive call, a recursive call is performed at step S58, and it shifts to processing of the code of the structure expression of a call place.

[0141] That is, a recursive call is performed by drawing 20 (B), and it shifts to processing of the code of the structure expression of a call place. And as shown in drawing 20 (C) and (D), branches B11, B12, and B13 are generated by processing of the code of the structure expression of this call place.

[0142] And as shown in drawing 20 (D), after processing of all the codes of the structure expression of a call place is completed, it returns to processing of the code of the structure expression of a calling agency at step S54. That is, as processing of the code of the structure expression of a calling agency shows to drawing 20 (E) and (F), branch B-2 is generated.

[0143] Thus, with this operation gestalt, if a recursive call is performed, processing of all the codes of the structure expression of a call place will be terminated (drawing 20 (D), drawing 20 (H), drawing 21 (D)). And after processing of all the codes of the structure expression of a call place is completed, it returns to processing of the code of the structure expression of a calling agency (drawing 20 (E), drawing 21 (A)).

[0144] By doing in this way, compared with the procedure shown in drawing 5 (A) - (J), the amount of the data which must be temporarily held to a stack etc. can be reduced, and resources, such as memory, can be used effectively now.

[0145] 4. An example of a hardware configuration, next the configuration of the hardware which can realize this operation gestalt is explained using drawing 22 .

[0146] A main processor 900 operates based on the program stored in CD982 (information storage medium), the program transmitted through the communication link interface 990, or the program stored in ROM950 (one of the information storage media), and performs various processings of game processing, an image processing, sound processing, etc.

[0147] A co-processor 902 assists processing of a main processor 900, has sum-of-products **** and the divider in which high-speed parallel operation is possible, and performs a matrix operation (vector operation) at a high speed. For example, an object is moved, or when a matrix operation etc. needs to be processed, the program which operates on a main processor 900 directs the processing for the physical simulation for making it operate (motion) at a co-processor 902 (request).

[0148] The geometry processor 904 performs geometry processing, such as coordinate transformation, transparent transformation, light source count, and curved-surface generation, has sum-of-products **** and the divider in which high-speed parallel operation is possible, and performs a matrix operation (vector operation) at a high speed. For example, in processing coordinate transformation, transparent transformation, light source count, etc., the program which operates by the main processor 900 directs the processing to the geometry processor 904.

[0149] The data extension processor 906 performs decoding which elongates the compressed image data and sound data, or performs processing which carries out the AKUSE rate of the decoding of a main processor 900. Thereby, in an opening screen, an INTAMISSHON screen, an ending screen, or a game screen, the dynamic image compressed by the MPEG method etc. can be displayed now. In addition, the image data and sound data which are set as the object of decoding are stored in ROM950 and CD982, or are transmitted from the outside through the communication link interface 990.

[0150] The drawing processor 910 performs drawing (rendering) processing of the object which consists of primitive sides, such as a polygon and a curved surface, at a high speed. If a main processor 900 is required in the case of drawing of an object while passing object data to the drawing processor 910 using the function of DMA controller 970, a texture will be transmitted to the texture storage section 924. Then, the drawing processor 910 draws an object at a high speed in a frame buffer 922, performing hidden surface removal using Z-uffer etc. based on these object data and textures. Moreover, the drawing processor 910 can perform alpha blending (translucent processing), depth queing, Mip Mapping, fog processing, bi-linear filtering, try linear filtering, anti-aliasing, shading processing, etc. And if the image for one frame is written in a frame buffer 922, the image will be displayed on a display 912.

[0151] The sound processor 930 builds in the ADPCM sound source of many channels etc., and generates high-definition game sounds, such as BGM, a sound effect, and voice. The generated game sound is outputted from a loudspeaker 932.

[0152] Data transfer of the actuation data from the game controller 942, the save data from a memory card 944, and the personal data is carried out through serial interface 940.

[0153] A system program etc. is stored in ROM950. In addition, in the case of a business-use game system, ROM950 will function as an information storage medium, and various programs will be stored in ROM950. In addition, you may make it use a hard disk instead of ROM950.

[0154] RAM960 is used as a working area of various processors.

[0155] DMA controller 970 controls the DMA transfer between a processor and memory (RAM, VRAM, ROM, etc.).

[0156] The CD drive 980 drives CD982 (information storage medium) with which a program, image data, or sound data is stored, and enables these programs and access to data.

[0157] The communication link interface 990 is an interface for performing data transfer between the exteriors through a network. In this case, as a network connected to the communication link interface 990, a communication line (an analog telephone line, ISDN), a high-speed serial bus, etc. can be considered. And the data transfer which minded the Internet by using a communication line becomes possible. Moreover, the data transfer between other game systems becomes possible by using a high-speed serial bus.

[0158] In addition, each means of this invention may perform the all only by hardware, and may perform them only by the program stored in an information storage medium, or the program distributed through a communication link interface. Or you may perform by both hardware and the program.

[0159] And when performing each means of this invention by both hardware and the program, the program for using each means of this invention, using hardware for an information storage, and performing will be stored. Data will be passed, if the above-mentioned program is more specifically required while directing processing in each processors 902, 904, 906, and 910 and 930 grades which are hardware. And each processors 902, 904, 906, and 910 and 930 grades will perform each means of this invention based on the directions and the passed data.

[0160] The example at the time of applying this operation gestalt to a business-use game system at drawing 23 (A) is shown. Looking at the game image projected on the display 1100, a player operates a lever 1102 and carbon button 1104 grade, and enjoys a game. Various processors, various memory, etc. are mounted in the system board (circuit board) 1106 built in. And the information (a program or data) for performing each means of this invention is stored in the memory 1108 which is an information storage medium on a system board 1106. Hereafter, this information is called storing information.

[0161] The example at the time of applying this operation gestalt to a game system for home use at drawing 23 (B) is shown. Looking at the game image projected on the display 1200, a player operates the game controllers 1202 and 1204 and enjoys a game. In this case, the above-mentioned storing information is stored in CD1206 which is the information storage medium which can be freely detached and attached to a body system or a memory card 1208, and 1209 grades.

[0162] The example at the time of applying this operation gestalt is shown in the system containing the terminal 1304-1 connected with host equipment 1300 and this host equipment 1300 at drawing 23 (C) through networks 1302 (a small-scale network like LAN, a wide area network like the Internet, etc.) - 1304-n (a game machine, cellular phone, etc.). In this case, the above-mentioned storing information is stored in the information storage media 1306, such as a magnetic disk drive with controllable host equipment 1300, a magnetic tape unit, and memory. When a terminal 1304-1 - 1304-n are what can generate a game image and a game sound by the stand-alone, from host equipment 1300, the game program for generating a game image and a game sound etc. is delivered by a terminal 1304-1 - 1304-n. On the other hand, when ungenerable by the stand-alone, a game image and a game sound are generated, and host equipment 1300 will transmit this to a terminal 1304-1 - 1304-n, and will output in a terminal.

[0163] In addition, in the configuration of drawing 23 (C), host equipment (server) and a terminal distribute, and it may be made to perform each means of this invention to it. Moreover, it distributes to the information storage medium of host equipment (server), and the information storage medium of a terminal, and you may make it store the above-mentioned storing information for performing each means of this invention.

[0164] Moreover, the terminal linked to a network may be a home video game system, and may be a business-use game system. And when connecting a business-use game system to a network, while an informational exchange is possible between business-use game systems, it is desirable to use the information storage device for save (a memory card, pocket mold game equipment) which can exchange informational also between home video game systems.

[0165] In addition, what [not only] was explained with the above-mentioned operation gestalt but various deformation implementation is possible for this invention.

[0166] For example, in invention which relates to a subordination claim among this inventions, it can also consider as the configuration which omits a part of requirements for a configuration of the claim of a subordination place. Moreover, the important section of invention concerning the independent claim of 1 of this invention can also be subordinated to other independent claims.

[0167] moreover -- this operation gestalt -- self -- mainly taking the case of L system, it explained as the recursive generation technique of an analog. the self in this invention -- although it is desirable that it is especially L system as for the recursive generation technique of an analog, it is also possible to use the Koch (koch) curve, a dragon curve, a middle point displacement method, a repetitive function system (IFS), etc. besides L system.

[0168] Moreover, the example was mainly taken and this operation gestalt explained the case where the image of a tree was generated. However, this invention is applicable to generation of vegetation other than a tree, geography (mountains), and various images, such as a gas body (clouds).

[0169] Moreover, various deformation implementation is possible also about the configuration of a structure expression, or the class of configuration specification parameter.

[0170] Moreover, this invention is applicable to various games (a fighting game, a shooting game, a robot versus fighting game, a sport game, a competition game, a role playing game, a music performance game, dance game, etc.).

[0171] Moreover, this invention is applicable to various game systems (image generative system), such as a system board which generates a business-use game system, a home video game system, the large-sized attraction system by which many players participate, a simulator, a multimedia terminal, and a game image.

[Translation done.]

* NOTICES *

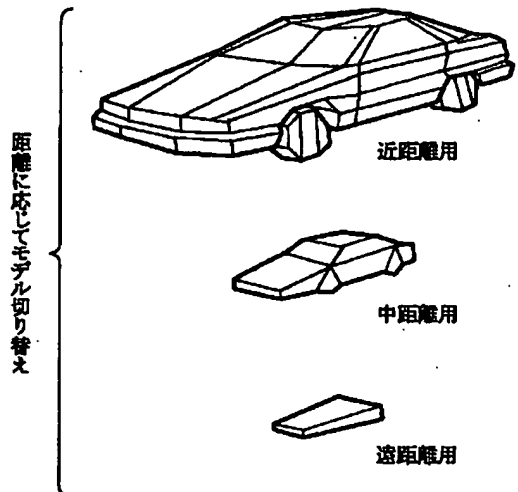
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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

(A)



(B)

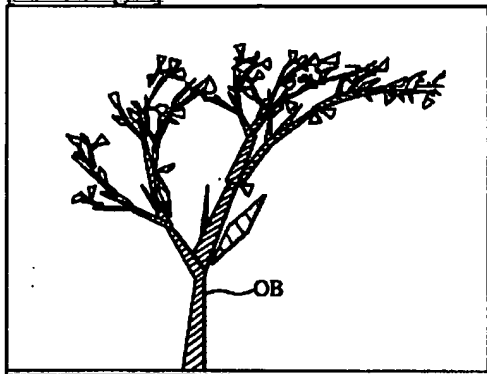
モデルデータ

近距離用モデルデータ					
X ₀	Y ₀	Z ₀	TX ₀	TY ₀	-----
X ₁	Y ₁	Z ₁	TX ₁	TY ₁	-----
中距離用モデルデータ					
X ₀	Y ₀	Z ₀	TX ₀	TY ₀	-----
X ₁	Y ₁	Z ₁	TX ₁	TY ₁	-----
遠距離用モデルデータ					
X ₀	Y ₀	Z ₀	TX ₀	TY ₀	-----
X ₁	Y ₁	Z ₁	TX ₁	TY ₁	-----

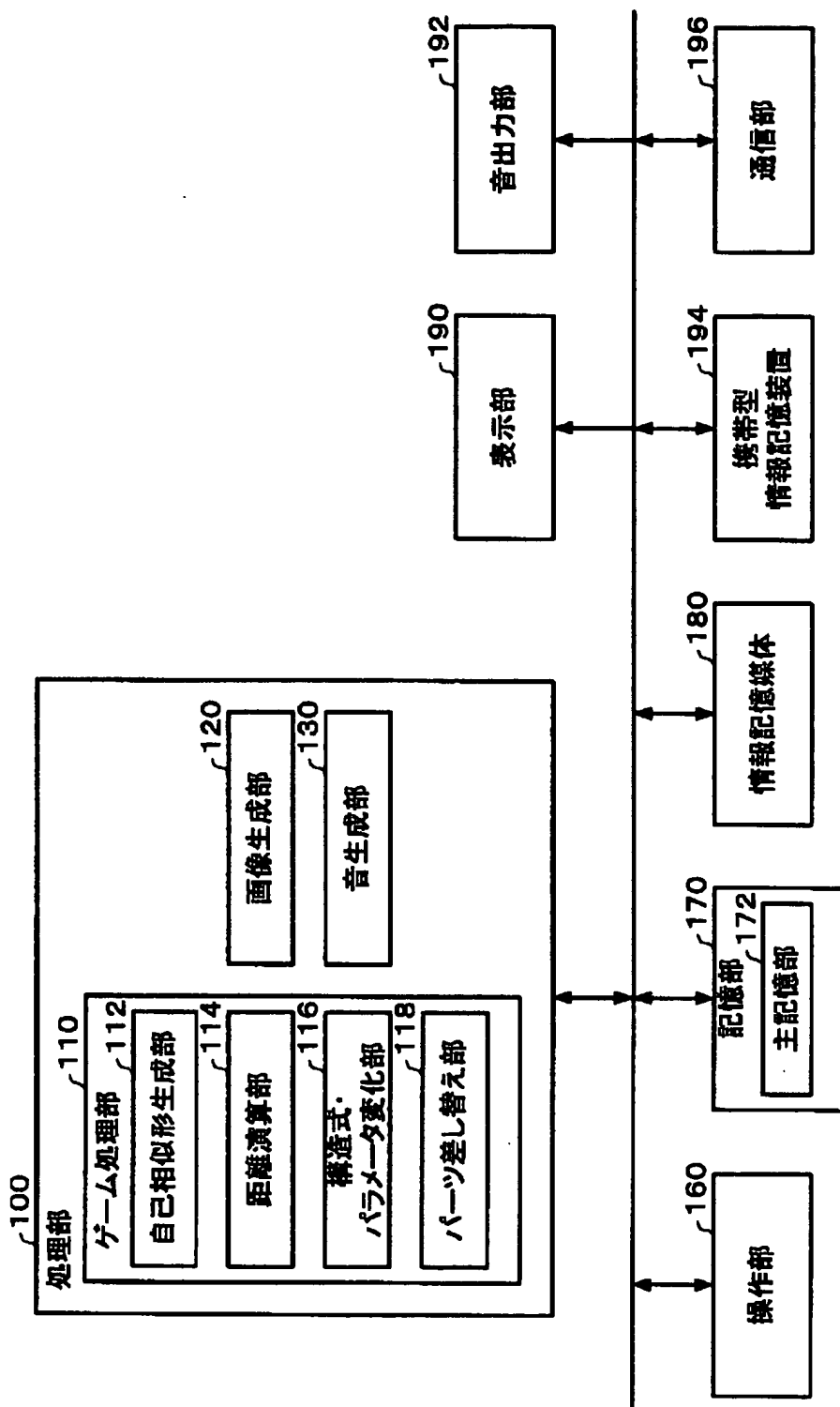
[Drawing 4]

コード	記号	動作内容
00		コードの終端
01	A	ノードを生成
02	B	枝を生成
03	L	葉を生成
04	F	花を生成
05		
06	[分岐開始
07]	分岐終了
08	+	右に曲がる
09	-	左に曲がる
0A	&	右にピッチする
0B	^	左にピッチする
0C	¥	右にロールする
0D	/	左にロールする
0E		180度回転
0F		

[Drawing 8]

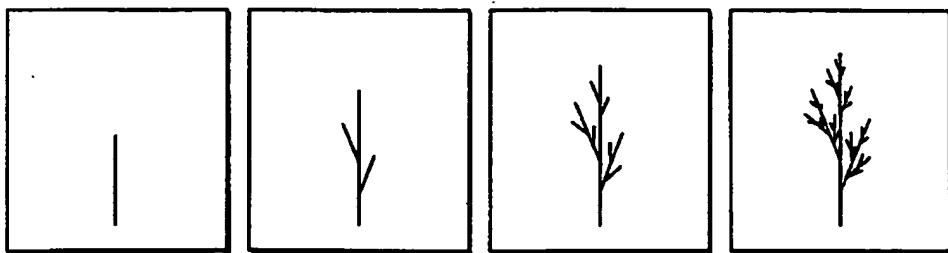
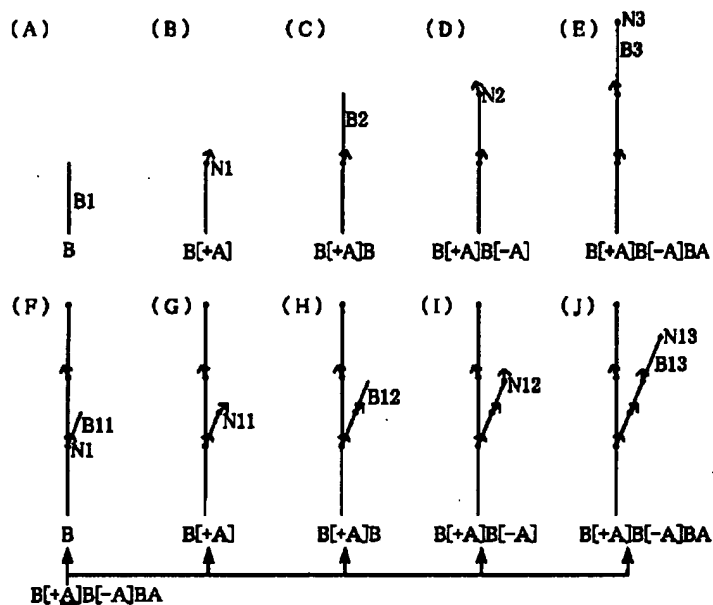


[Drawing 2]



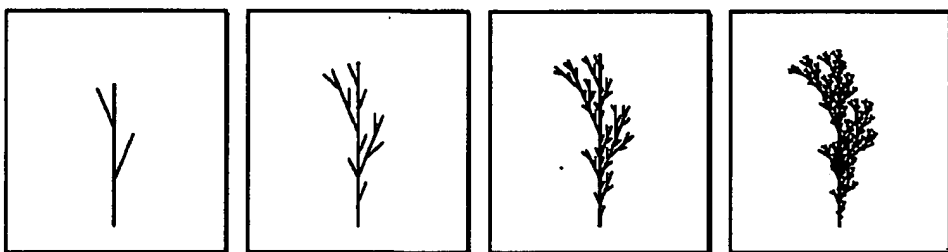
[Drawing 3]

ノード・リライティング

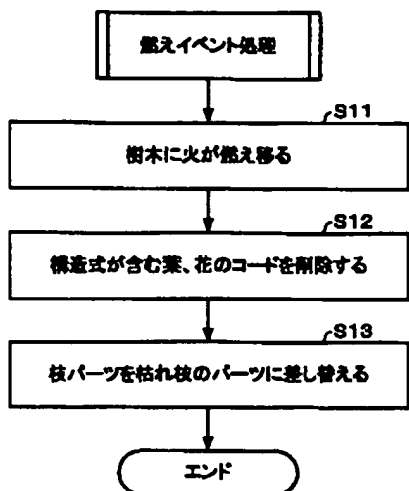
[Drawing 5]
ノード・リライティング

[Drawing 6]

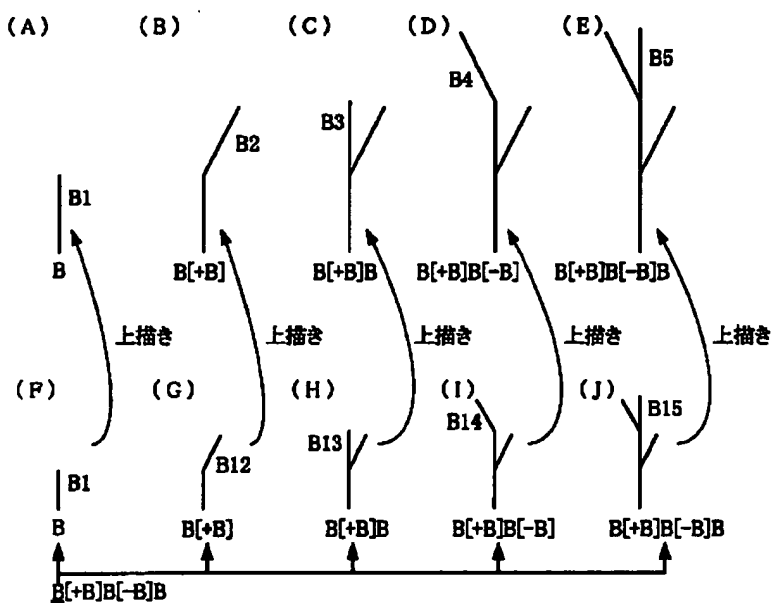
エッジ・リライティング



[Drawing 15]



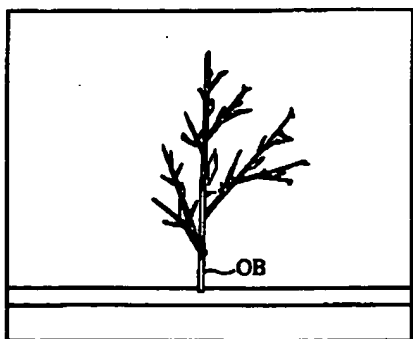
[Drawing 7]
エッジ・リライティング



[Drawing 9]

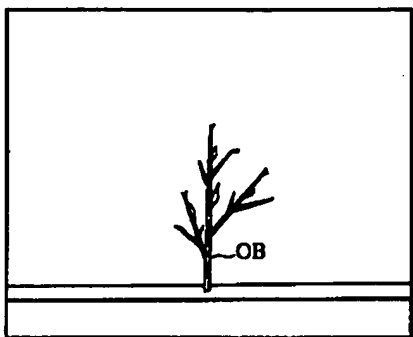
(A)

近距離
(繰り返し回数大)



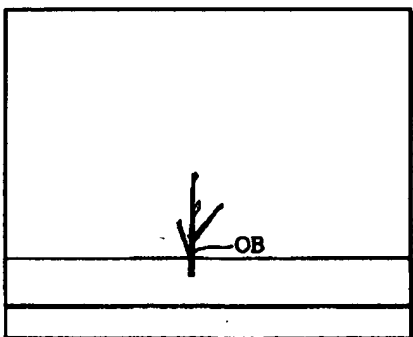
(B)

中距離
(繰り返し回数中)

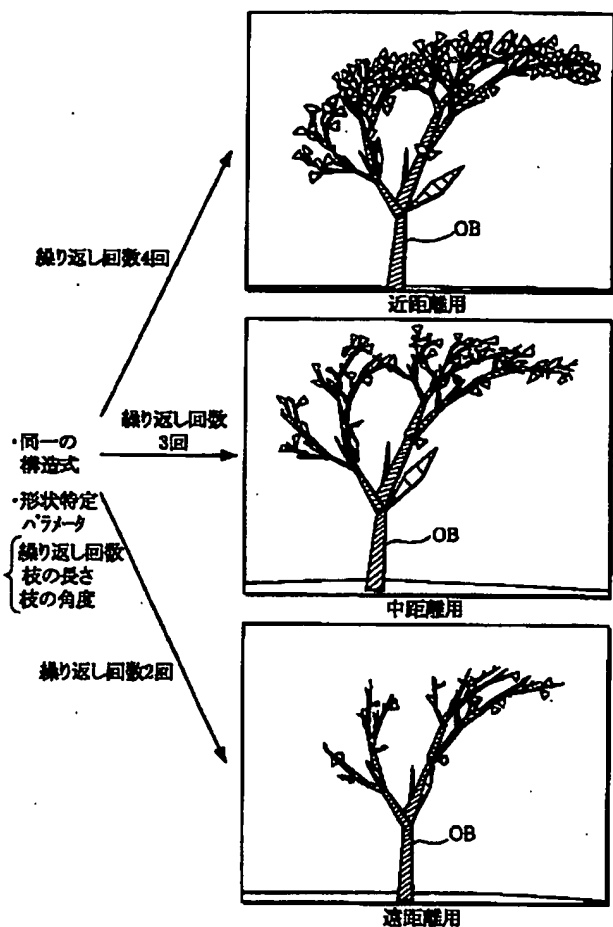


(C)

遠距離
(繰り返し回数小)



[Drawing 10]



[Drawing 11]

(A)

原型

$A \rightarrow [+WA- / L] [- / A + F] + A$

(B)

ゲーム状況の変化に応じて

コードを書き換える

$A \rightarrow [+WA- / L] [- / A + L] + A$

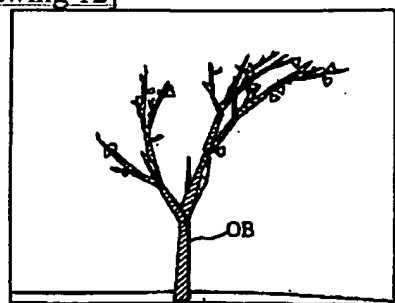
(C)

ゲーム状況の変化に応じて

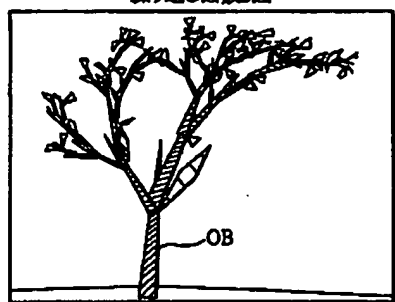
コードを付加する

$A \rightarrow [+WA- / L] [+WL] [/ + L] - / A + L + A$

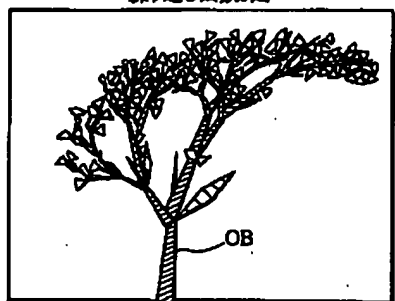
[Drawing 12]



繰り返し回数2回



繰り返し回数3回



繰り返し回数4回

ゲーム状況の
変化に応じて繰り
返し回数を
変化する

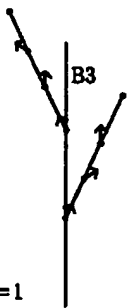
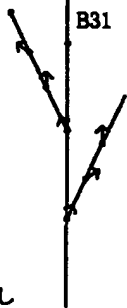
[Drawing 21]

(A)

(B)

(C)

(D)

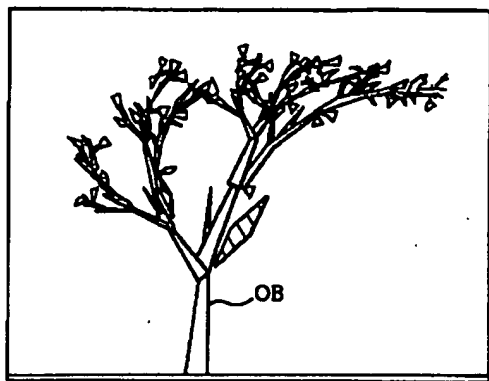
 $B[+A]B[-A]B$  $B[+A]B[-A]BA$ 

B

 $B[+A]B[-A]BA$

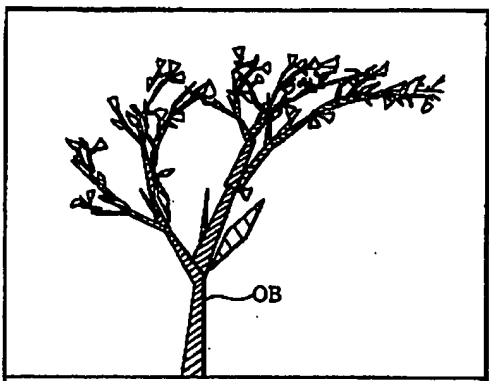
[Drawing 13]

(A)

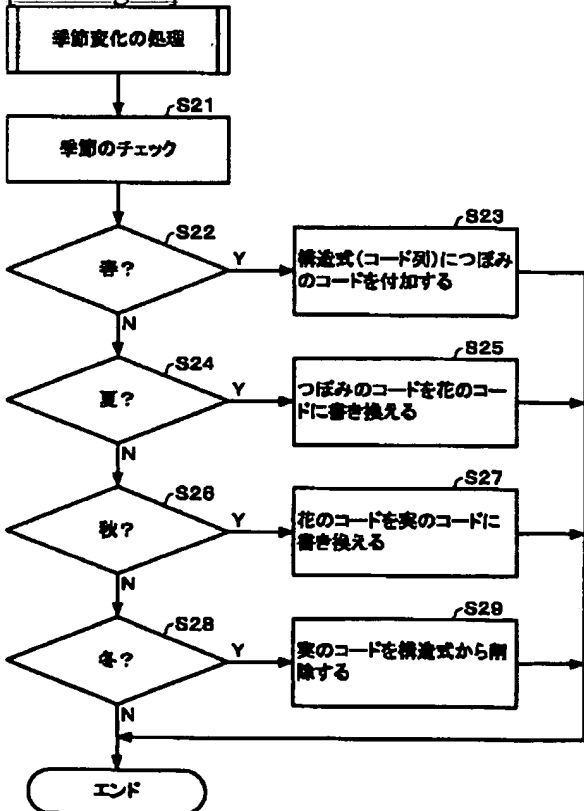


ゲーム状況に応じて
基本パーツを差し替える

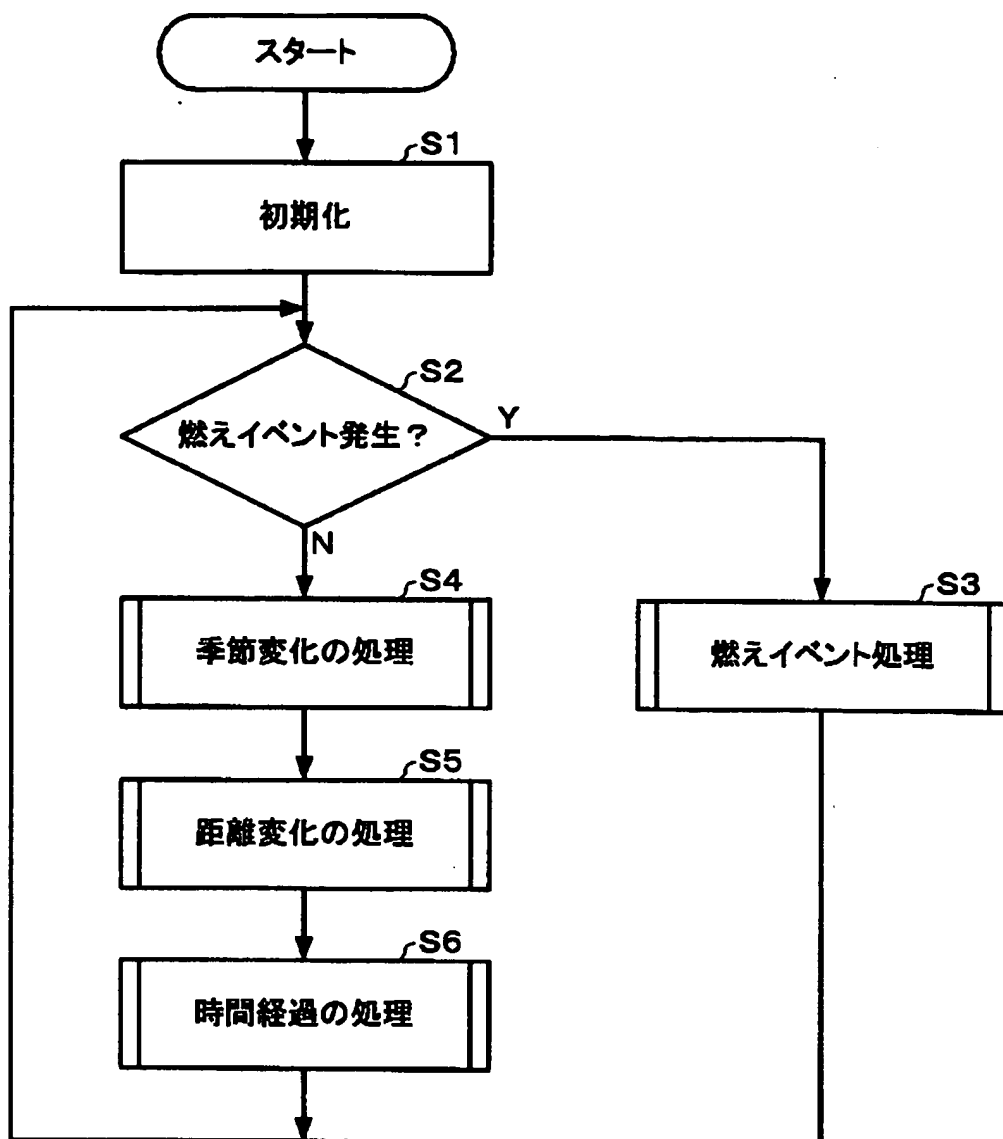
(B)



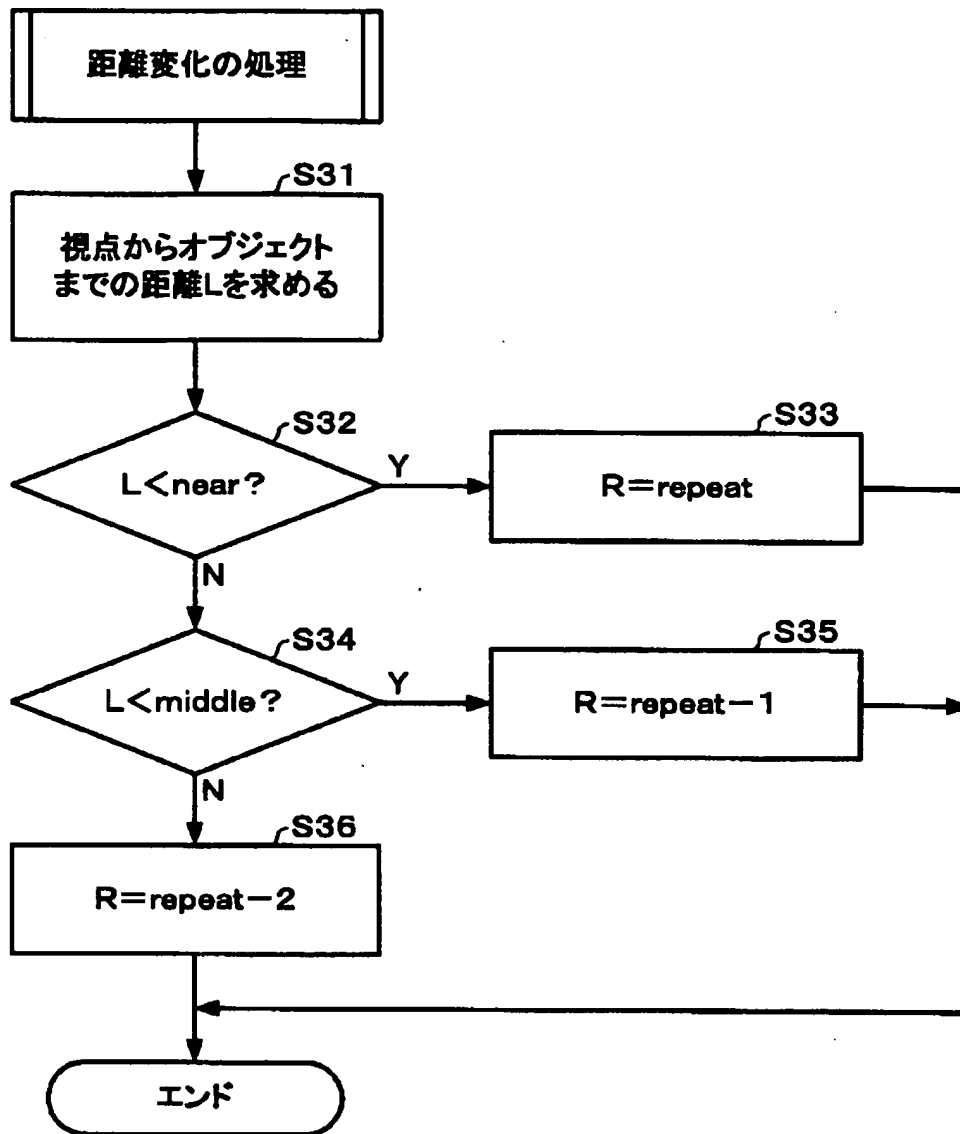
[Drawing 16]



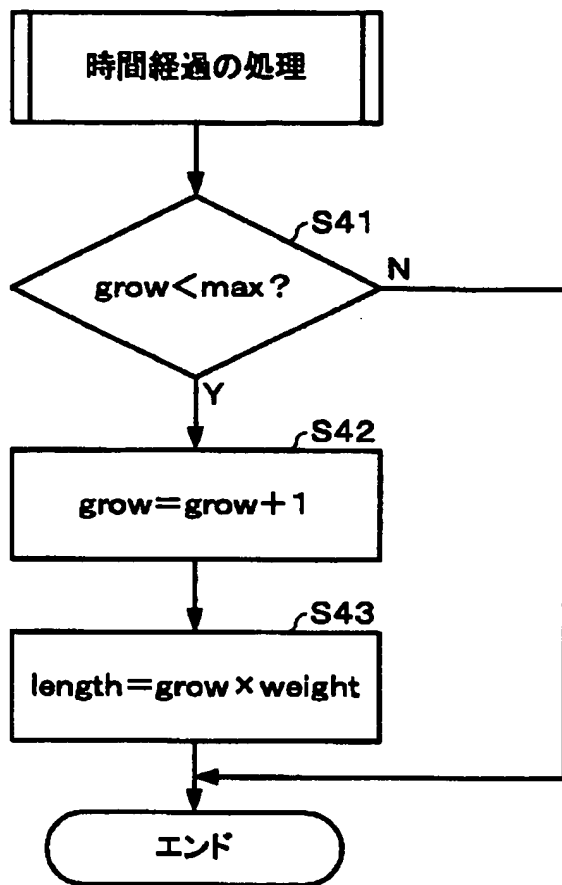
[Drawing 14]



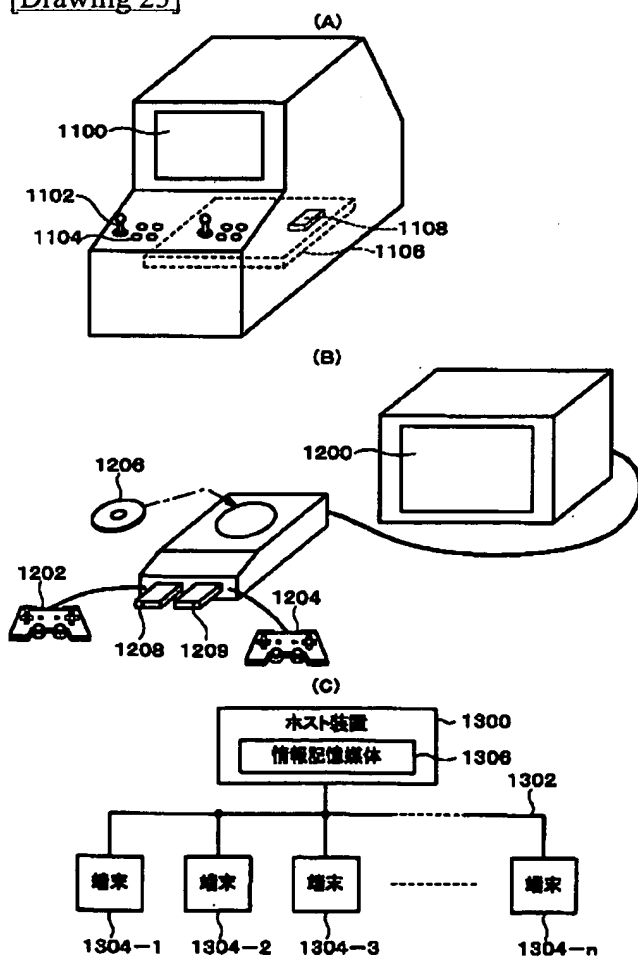
[Drawing 17]



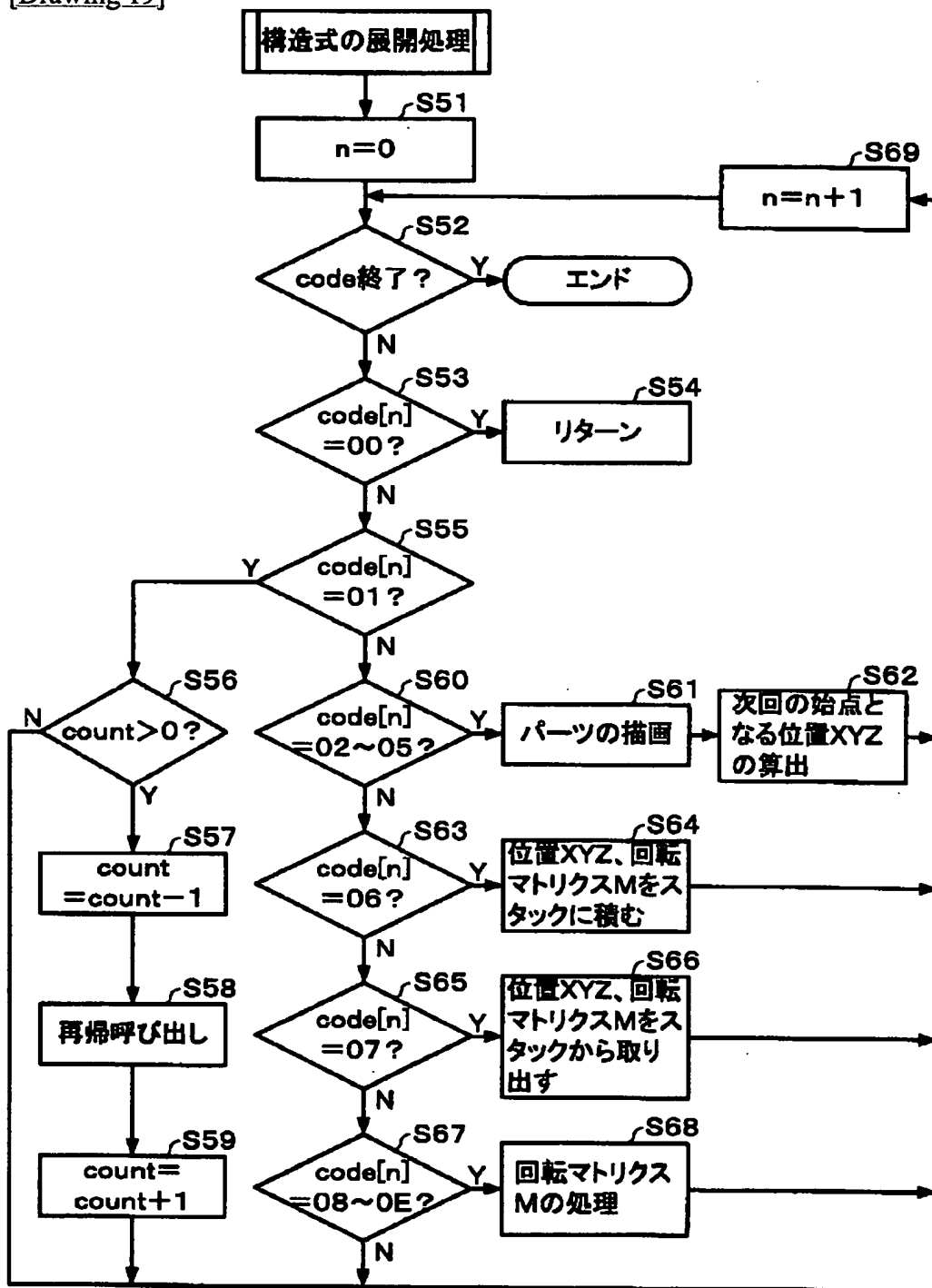
[Drawing 18]



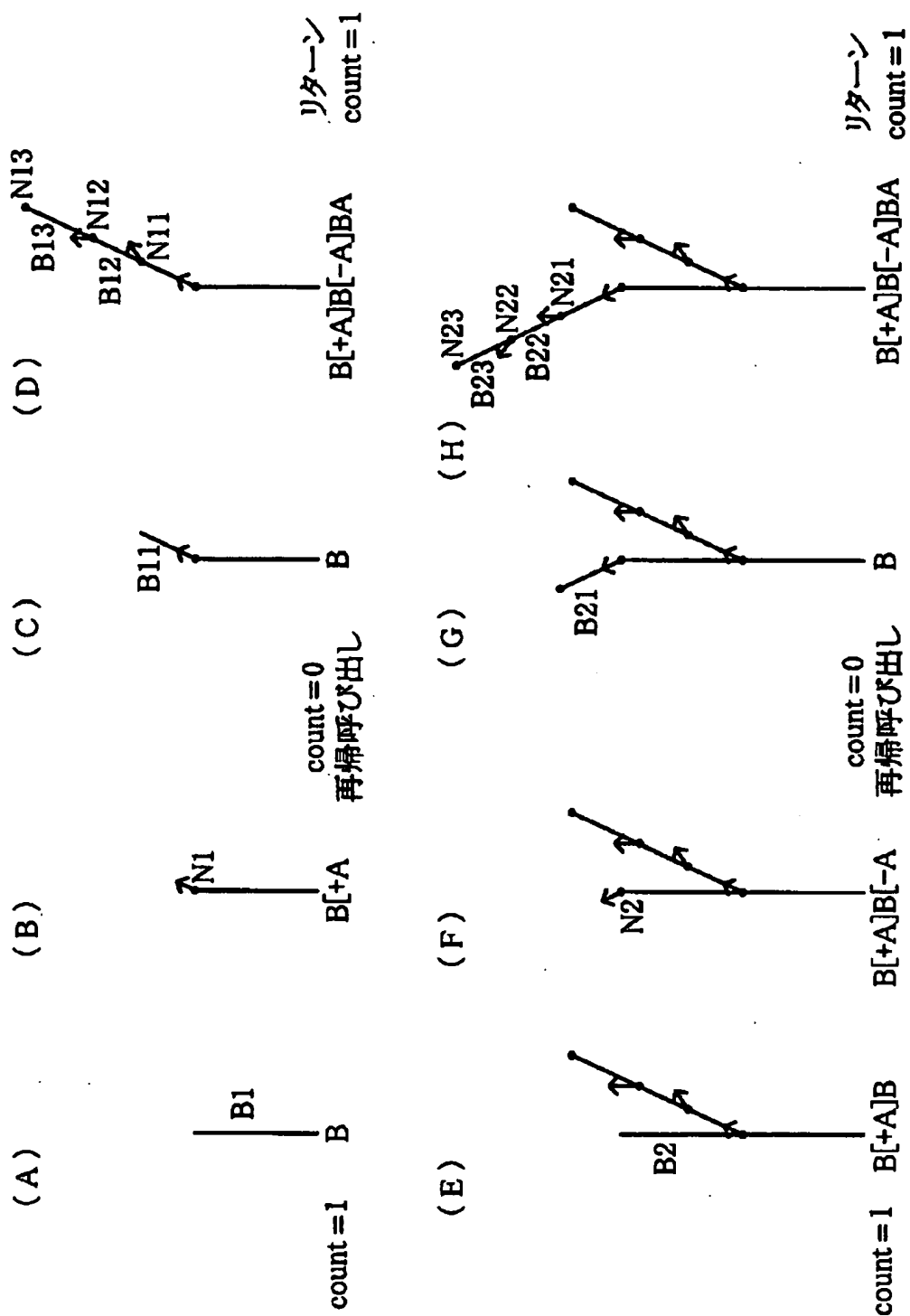
[Drawing 23]



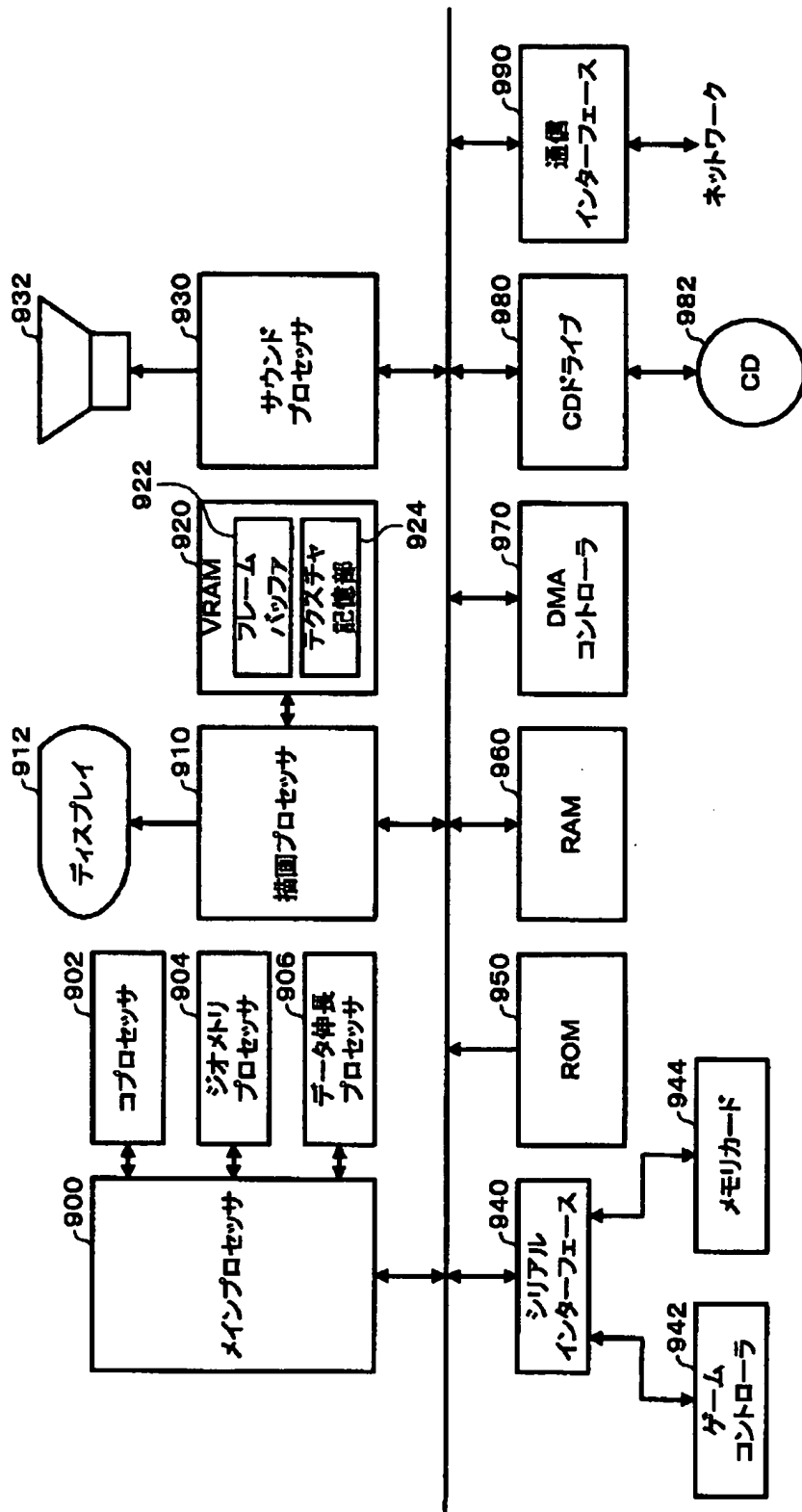
[Drawing 19]



[Drawing 20]



[Drawing 22]



[Translation done.]